CENTER FOR TRANSGENIC ANIMALS AND PLANTS

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The worldwide genome project has almost been completed and research on basic biology has arrived at a post-genome era in which researchers are focusing on investigating the functions of individual genes. To promote the functional analysis of a gene of interest it is essential to utilize genetically altered model organisms generated using genetic engineering technology, including gene deletion, gene replacement and point mutation.

The NIBB Center for Transgenic Animals and Plants (CTAP) was established in April 1998 to support research using transgenic and gene targeting techniques at NIBB. The CTAP is managed by the head (professor, a concurrent post) and three associate professors.

Figure 1. The new center facility for transgenic animals in the Yamate area

Technical staff and supporting staff develop and promote research-supporting activities. A state-of-the-art facility for transgenic animals opened at the end of 2003 in the Yamate area.

The activities of the CTAP are as follows:

1. The provision of information, materials, techniques and animal housing space to researchers.
2. The use of various kinds of instruments to analyze mutant, transgenic, and gene-targeted animals and plants.
3. The development of novel techniques related to transgenic and gene targeting technology.
4. Cryopreservation and storage of transgenic strains.

I. Research support activities (mouse)

In 2001 the NIBB mouse facility (built under specific pathogen free (SPF) conditions) opened in the Myodaiji area and the production, breeding, analysis, cryopreservation and storage of genetically manipulated mouse strains has been conducted there since then. The new CTAP building in the Yamate area strengthened research activities using genetically altered organisms. The building has five floors and a total floor space of 2,500 m^2 in which we can generate, breed, store and analyze transgenic, gene targeting and mutant mice under SPF conditions. The mouse housing area was constructed based on a barrier system. This building is also equipped with breeding areas for transgenic small fish, birds and insects.

Figure 2. Liquid nitrogen storage equipment for cryopreservation

In 2009 (from January 1 to December 31) 4,639 mice and 1,107 fertilized eggs were brought into the CTAP in the Yamate area, and 38,835 mice (including pups bred in the facility) and 139 fertilized eggs were taken out.

A number of strains of genetically altered mice from outside the CTAP were brought into the mouse housing area by microbiological cleaning using *in vitro* fertilization-embryo transfer techniques, and stored using cryopreservation.

A new mouse facility in the Myodaiji area opened at the beginning of 2005. The facility provides research-supporting activities to researchers in the Myodaiji area. At March 2009, we expanded the facility which includes areas for breeding, behavioral tests and transgenic studies using various kinds of recombinant viruses. In 2009 (from January 1 to December 31) 44 mice were brought into the CTAP in the Myodaiji area, and 585 mice (including pups bred in the facility) were taken out.

Figure 3. Breeding equipment for mice and rats in transgenic studies using recombinant viruses

II. Research support activities (small fish, birds, and insects)

The first floor of the CTAP building in the Yamate area provides space and facilities to maintain small fish, chick embryos, and insects. In the laboratory room for chick embryos, a large incubation chamber is equipped and set at 42 degrees (suitable for chick embryogenesis). For researchers who need fish, 480 tanks (1 liter) and 450 tanks (3 liters) are available for medaka and zebrafish, respectively. Water circulates and can be maintained to suit the conditions desired for fish breeding in the aquarium systems. Currently, five or more mutant lines and ten or more transgenic lines of medaka and zebrafish are maintained in our facility. In addition to the rooms mentioned above, another room is available for insects. All the rooms are qualified to meet the criteria for transgenic animals, allowing researchers to generate and maintain these important research tools.

In 2009 (from January 1 to December 31), 4,461 medaka and zebrafish (180 eggs, 1,230 embryos and 3,051 adults) were brought to the facility and 91,786 medaka and zebrafish (89,710 fertilized eggs, 1,070 embryos and 1,006 adults, including animals bred in the facility) were taken out. In the laboratory for chick embryos 7,925 fertilized chicken eggs were brought in and 23 fertilized eggs and 44 chicken embryos were taken out. These animals were used for research activities in neurobiology and developmental biology.

In 2007 NIBB was approved as a core facility of the National BioResource Project (NBRP) for Medaka by the Japanese Government. We have supported the activities of NBRP Medaka by providing standard strains, induced mutants and transgenic lines and training personnel regarding fish maintenance. As the result of the NBRP project, medaka transgenic strains have been successfully generated in the CTAP, which allows inducing the gene of interest by heat treatment in combination with a Cre/loxP system.

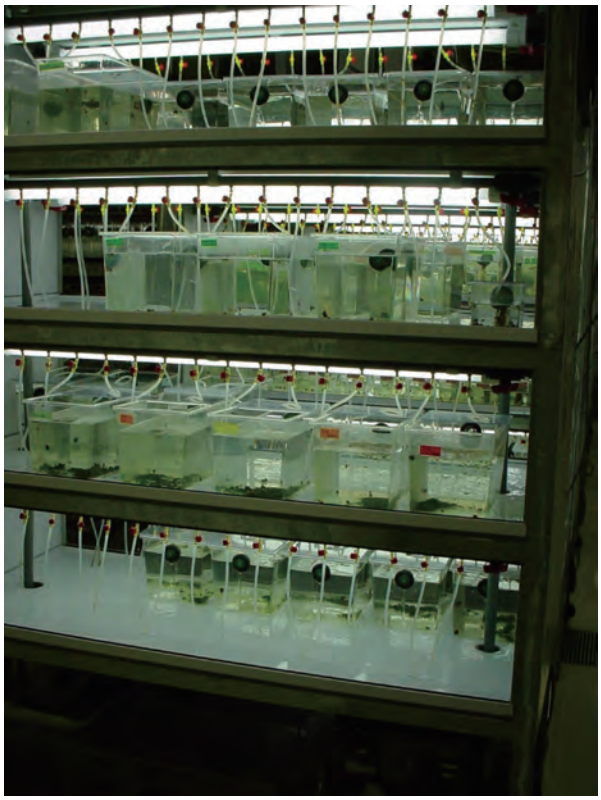

Figure 4. Breeding equipment for small fish

III. Academic activities

The associate professors of this center - E. Watanabe, T. Sasaoka and M. Tanaka - are the principal investigators of the Laboratory of Neurophysiology, the Laboratory of Neurochemistry and the Laboratory of Molecular Genetics for Reproduction, respectively. The Laboratory of Neurophysiology is studying mechanisms of the visual system using a psychophysical approach. The Laboratory of Neurochemistry is studying the physiological role of the dopaminergic system using genetically altered mice. The Laboratory of Molecular Genetics for Reproduction is studying the molecular mechanisms of reproductive organ development and sex differentiation using mutagenized or transgenic medaka. For details, please refer to the academic activities of each laboratory.